

FORM PTO-1390
(REV. 1-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

G-82

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

09/889659

INTERNATIONAL APPLICATION NO.

PCT/FR99/03221

INTERNATIONAL FILING DATE

DEC. 21, 1999

PRIORITY DATE CLAIMED

22 Jan 1999

TITLE OF INVENTION

MAINTENANCE OF AN ANTI COLLISION CHANNEL IN AN ELECTRONIC
IDENTIFICATION SYSTEM

APPLICANT(S) FOR DO/EO/US

MARC ENRICO

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☐ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98. *To Follow*
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: *PCT 616110 - 1 page*

| | | | | | |
|---|--------------|--|------------|--|----|
| U.S. APPLICATION NO. (if known) 097/889659 | | INTERNATIONAL APPLICATION NO. PCT/FR 99/03221 | | ATTORNEY'S DOCKET NUMBER G-82 | |
| 17. <input type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1070.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$930.00 \$860 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$790.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$720.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$98.00 ENTER APPROPRIATE BASIC FEE AMOUNT = | | | | CALCULATIONS PTO USE ONLY <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">\$ 860</div> | |
| Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)). | | | | \$ | |
| CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE | \$ | |
| Total claims | - 20 = | | x \$22.00 | \$ | |
| Independent claims | - 3 = | | x \$82.00 | \$ | |
| MULTIPLE DEPENDENT CLAIM(S) (if applicable) | | | + \$270.00 | \$ | |
| TOTAL OF ABOVE CALCULATIONS = | | | | \$ | |
| Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28). | | | | \$ | |
| SUBTOTAL = | | | | \$ | |
| Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)). | | | | \$ | |
| TOTAL NATIONAL FEE = | | | | \$ | |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property + | | | | \$ 40 | |
| TOTAL FEES ENCLOSED = | | | | \$ 900 | |
| | | | | Amount to be refunded: | \$ |
| | | | | charged: | \$ |
| a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>900⁰⁰</u> to cover the above fees is enclosed. | | | | | |
| b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. | | | | | |
| c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>16-2128</u> . A duplicate copy of this sheet is enclosed. | | | | | |
| NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status. | | | | | |
| SEND ALL CORRESPONDENCE TO Roland Plottel Rockefeller Center Stn. P.O. Box 293 New York, N.Y. 10185-0293 | | | | | |
| | | | | SIGNATURE <u>Roland Plottel</u> NAME <u>ROLAND PLOTTEL</u> REGISTRATION NUMBER <u>26707</u> | |
| 212 489-7073 | | | | | |

Atty. Dkt. G-82

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Marc ENRICO
Serial No. : New U.S. Appl.
Int'l App. : PCT/FR99/03221
Int'l File Date : 21 December, 1999

PRELIMINARY AMENDMENT A

Please amend:

IN THE CLAIMS:

Claims 5, 6 and 7 to read as follows.

5. A communication system according to Claim 1 characterized in that the identified transponder (TRI) resumes the cyclic sending of its identifier (Id) after a random pause time (P) in the case where no modification (M) of the interrogation signal has occurred during the duration (D) of listening (E).

6. A communication system according to claim 1, characterized in that the modification (M) of the interrogation signal consists of a mute in the sending of the continuously sent interrogation signal (INT).

7. A communication system according to claim 1, characterized in that the command (C) sent by the interrogator unit comprises information to be read and/or written and/or executed by the identified transponder (TR1).

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| 1990-1991 | | 1991-1992 | | 1992-1993 | | 1993-1994 | | 1994-1995 | | 1995-1996 | | 1996-1997 | | 1997-1998 | | 1998-1999 | | 1999-2000 | | 2000-2001 | | 2001-2002 | | 2002-2003 | | 2003-2004 | | 2004-2005 | | 2005-2006 | | 2006-2007 | | 2007-2008 | | 2008-2009 | | 2009-2010 | | 2010-2011 | | 2011-2012 | | 2012-2013 | | 2013-2014 | | 2014-2015 | | 2015-2016 | | 2016-2017 | | 2017-2018 | | 2018-2019 | | 2019-2020 | | 2020-2021 | | 2021-2022 | | 2022-2023 | | 2023-2024 | | 2024-2025 | | 2025-2026 | | 2026-2027 | | 2027-2028 | | 2028-2029 | | 2029-2030 | | 2030-2031 | | 2031-2032 | | 2032-2033 | | 2033-2034 | | 2034-2035 | | 2035-2036 | | 2036-2037 | | 2037-2038 | | 2038-2039 | | 2039-2040 | | 2040-2041 | | 2041-2042 | | 2042-2043 | | 2043-2044 | | 2044-2045 | | 2045-2046 | | 2046-2047 | | 2047-2048 | | 2048-2049 | | 2049-2050 | | 2050-2051 | | 2051-2052 | | 2052-2053 | | 2053-2054 | | 2054-2055 | | 2055-2056 | | 2056-2057 | | 2057-2058 | | 2058-2059 | | 2059-2060 | | 2060-2061 | | 2061-2062 | | 2062-2063 | | 2063-2064 | | 2064-2065 | | 2065-2066 | | 2066-2067 | | 2067-2068 | | 2068-2069 | | 2069-2070 | | 2070-2071 | | 2071-2072 | | 2072-2073 | | 2073-2074 | | 2074-2075 | | 2075-2076 | | 2076-2077 | | 2077-2078 | | 2078-2079 | | 2079-2080 | | 2080-2081 | | 2081-2082 | | 2082-2083 | | 2083-2084 | | 2084-2085 | | 2085-2086 | | 2086-2087 | | 2087-2088 | | 2088-2089 | | 2089-2090 | | 2090-2091 | | 2091-2092 | | 2092-2093 | | 2093-2094 | | 2094-2095 | | 2095-2096 | | 2096-2097 | | 2097-2098 | | 2098-2099 | | 2099-2100 | | 2100-2101 | | 2101-2102 | | 2102-2103 | | 2103-2104 | | 2104-2105 | | 2105-2106 | | 2106-2107 | | 2107-2108 | | 2108-2109 | | 2109-2110 | | 2110-2111 | | 2111-2112 | | 2112-2113 | | 2113-2114 | | 2114-2115 | | 2115-2116 | | 2116-2117 | | 2117-2118 | | 2118-2119 | | 2119-2120 | | 2120-2121 | | 2121-2122 | | 2122-2123 | | 2123-2124 | | 2124-2125 | | 2125-2126 | | 2126-2127 | | 2127-2128 | | 2128-2129 | | 2129-2130 | | 2130-2131 | | 2131-2132 | | 2132-2133 | | 2133-2134 | | 2134-2135 | | 2135-2136 | | 2136-2137 | | 2137-2138 | | 2138-2139 | | 2139-2140 | | 2140-2141 | | 2141-2142 | | 2142-2143 | | 2143-2144 | | 2144-2145 | | 2145-2146 | | 2146-2147 | | 2147-2148 | | 2148-2149 | | 2149-2150 | | 2150-2151 | | 2151-2152 | | 2152-2153 | | 2153-2154 | | 2154-2155 | | 2155-2156 | | 2156-2157 | | 2157-2158 | | 2158-2159 | | 2159-2160 | | 2160-2161 | | 2161-2162 | | 2162-2163 | | 2163-2164 | | 2164-2165 | | 2165-2166 | | 2166-2167 | | 2167-2168 | | 2168-2169 | | 2169-2170 | | 2170-2171 | | 2171-2172 | | 2172-2173 | | 2173-2174 | | 2174-2175 | | 2175-2176 | | 2176-2177 | | 2177-2178 | | 2178-2179 | | 2179-2180 | | 2180-2181 | | 2181-2182 | | 2182-2183 | | 2183-2184 | | 2184-2185 | | 2185-2186 | | 2186-2187 | | 2187-2188 | | 2188-2189 | | 2189-2190 | | 2190-2191 | | 2191-2192 | | 2192-2193 | | 2193-2194 | | 2194-2195 | | 2195-2196 | | 2196-2197 | | 2197-2198 | | 2198-2199 | | 2199-2200 | | 2200-2201 | | 2201-2202 | | 2202-2203 | | 2203-2204 | | 2204-2205 | | 2205-2206 | | 2206-2207 | | 2207-2208 | | 2208-2209 | | 2209-2210 | | 2210-2211 | | 2211-2212 | | 2212-2213 | | 2213-2214 | | 2214-2215 | | 2215-2216 | | 2216-2217 | |
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This amendment removes multi-dependent claims. All remaining claims after amendments are singly dependant.

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25 5. A communication system according to Claim 1
or ~~Claim 4~~, characterised in that the identified
transponder (TR1) resumes the cyclic sending of its
identifier (Id) after a random pause time (P) in the
case where no modification (M) of the interrogation
signal has occurred during the duration (D) of
listening (E).

6. A communication system according to ^{claim 1} ~~any one~~
~~of the previous claims~~, characterised in that the
modification (M) of the interrogation signal consists
of a mute in the sending of the continuously sent
5 interrogation signal (INT).

7. A communication system according to ^{claim 1} ~~any one~~
~~of the previous claims~~, characterised in that the
command (C) sent by the interrogator unit comprises
information to be read and/or written and/or executed
10 by the identified transponder (TR1).

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MAINTENANCE OF AN ANTICOLLISION CHANNEL IN AN
ELECTRONIC IDENTIFICATION SYSTEM

5 The present invention relates to a system of communication between a sending/receiving interrogator unit and a plurality of transponders.

The present invention also relates to a method of operation of such a communication system.

10 The present invention applies to any radiofrequency communication system but also to any contactless communication system such as infrared, that is to say any system not requiring a physical interconnection of the communication units.

15 In such systems, the interrogator unit sends signals according to an established protocol to the transponders in order to interrogate them. The interrogator unit is also able to read and interpret the content of the transponders.

A transponder is constituted by a transceiver associated with an item which has to be identified such as a vehicle, a warehouse article, a human being or some other item, and replying automatically to an external interrogation signal coming from the interrogator unit.

A transponder generally has a microcircuit connected to a coil forming an antenna.

The interrogator unit is generally constituted by a system operating by radiofrequency.

In the state of the art, there are many identification systems having an interrogator unit and a plurality of transponders.

The main problem associated with these identification systems lies in the collision between a number of identification signals coming from different transponders. This is because it is possible for a transponder sending an identification signal to the interrogator to be interrupted by the sending of another identification signal from another transponder, which adversely affects the recognition of each transponder.

A number of anticollision systems associated with these communication systems have been proposed in the prior art.

These anticollision systems are generally difficult to implement, and they are often complex to use and of high cost.

Solutions for remedying these drawbacks have been proposed in the state of the art. Thus, European

patent EP-A 0 585 132 describes an anticollision system associated with a communication system which is much simpler to implement.

This patent explains two principles making it possible to avoid the collision between signals coming from different transponders sent to the interrogator.

A first anticollision principle which is relatively easy to implement consists of desynchronizing the transponders.

According to this principle, illustrated in Figure 1, each transponder TR present in the detection field of an interrogator unit sends its identifier Id cyclically with pauses P of random duration. Each pause time P is the result of the multiplication between the identifier sending duration D_i and a random number N. Each transponder TR therefore operates alternately in sending mode and pause mode.

Thus, the desynchronized sending of the transponders makes it possible to obtain one or more time slots in which a single transponder TR sends its identifier Id. As illustrated in Figure 1, the cases in grey are situations where a number of transponders are sending at the same time and in that case none is correctly identified by the interrogator unit. In the other cases, a single transponder sends during a given time slot and can in that case be correctly identified.

A second anticollision principle, also easy to implement, is described in the patent cited above and illustrated in Figure 2.

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transponders in pause mode consists essentially of a mute of the signal of a few microseconds. This mute has the effect of reinitializing the counting of the pause time with a new random number N.

5 The anticollision principle described in this patent is reliable and easy to implement.

Nevertheless, the description which is given thereof allows this principle to be used only on transponders in read mode alone.

10 More precisely, such an anticollision principle does not make it possible to maintain the anticollision channel open between the interrogator unit and the transponder for carrying out a write operation or for execution of a command by the transponder.

15 The present invention seeks to overcome this drawback.

20 The aim of the present invention is consequently to propose maintaining an anticollision channel open between an interrogator and a transponder operating in read/write mode.

One object of the present invention is more particularly a system of communication between an interrogator unit and a plurality of transponders,

25 whereby the interrogator unit is able to detect a start of sending from a transponder and then modify its interrogation signal so as to maintain the other transponders in a watching state,

30 whereby the silent transponders are able to interpret the modification of the interrogation signal as an extended silence command, and the detected

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transponder is able to continue its sending despite the modification of the interrogation signal,

characterised in that, after identification of the detected transponder,

5 the interrogator unit, on the one hand, again modifies its interrogation signal so as to extend the watching state of the silent transponders and, on the other hand, sends a command to the identified transponder, the silent transponders again being able
10 to interpret the modification of the interrogation signal as an extended silence request,

and in that, at the end of sending its identifier, the detected transponder goes into listening mode for a given duration during which it is
15 able to interpret and then execute the command sent by the interrogator unit.

According to another characteristic, each transponder has time counting means and means of reinitializing the time counting on receiving a
20 modification of the interrogation signal.

According to another characteristic, the time counting means are able to determine a predetermined duration of listening of the detected transponder, during which said transponder sends no signal.

25 The communication system according to the present invention is also characterised in that, after the execution of a command, the identified transponder returns to listening mode for the predetermined duration in order to allow a new communication phase, a
30 new modification of the interrogation signal

reinitializing the watching state of the non-identified transponders, and a new command being sent by the interrogator unit, interpreted and executed by the identified transponder.

5 According to another characteristic, the identified transponder resumes the cyclic sending of its identifier after a random pause time in the case where no modification of the interrogation signal has occurred during the duration of listening.

10 According to another characteristic, the modification of the interrogation signal consists of a mute in the sending of the continuously sent interrogation signal.

15 According to another characteristic, the command sent by the interrogator unit comprises information to be read and/or written and/or executed by the identified transponder.

20 Another object of the present invention is a method of communication between an interrogator unit and a plurality of transponders comprising the following steps:

 a - sending of a continuous interrogation signal by the interrogator unit;

25 b - sending of a message start frame by a transponder;

 c - detection of this frame by the interrogator unit;

 d - modification of the interrogation signal so as to set the silent transponders into a watching state

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for a duration D1 so as to prevent them sending their identification signal;

e - reading of the identification message by the interrogator unit;

5 the method being characterised in that it also has the following steps:

f - setting the identified transponder into listening mode;

10 g - modification of the interrogation signal so as to reinitialize the watching state of the silent transponders for a duration D2 so as to prevent them sending their identification signal;

h - sending of a command by the interrogator unit to the identified transponder;

15 i - execution of the command by the identified transponder;

j - sending of the reply from the transponder.

According to another characteristic, the communication method also comprises a plurality of supplementary steps, these supplementary steps consisting of returning the identified transponder to listening mode after the step j and of carrying out the operations g to j in a loop so as to perform a plurality of operations on the identified transponder.

25 According to another characteristic, the duration D2 is equal to the duration D1 added to the time for executing an operation, the duration D1 corresponding to the identifier sending duration multiplied by a random number.

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The communication system with maintenance of an anticollision channel according to the invention has the advantage of making it possible to exchange information between an interrogator and a transponder in a manner which is reliable and easy to implement.

The system according to the invention makes it possible to use more advanced transponders requiring data transfers between the interrogator and the identified transponder such as for example the submission of keys (passwords, authentication, mutual recognition), the writing of information into the transponder (register update), the loading or updating of programs, or the reading of information from the transponder memory.

Other aspects and advantages of the invention will emerge in the remainder of the description with reference to the figures in which:

Figure 1 is a diagram of the mode of operation of an anticollision system according to a first known principle of the state of the art.

Figure 2 is a diagram of the mode of operation of an anticollision system according to a second known principle of the state of the art.

Figure 3 is a diagram of the mode of operation of an anticollision system according to the present invention.

Figure 4 is a diagram of the operations performed by the interrogator unit according to the invention.

Figure 5 is a diagram of the operations performed by a transponder according to the invention.

Figure 6 is a sketch of the steps for the sending of a signal by a transponder according to the present invention.

Figures 1 and 2 have been described previously and depict principles for implementing known anticollision systems of the state of the art.

Figure 3 depicts the implementation of the communication system according to the present invention with maintenance of an anticollision channel open between an interrogator unit and a transponder for reading/writing.

The implementation of the system according to the present invention breaks down into two distinct phases. The first step consists of an identification step, the implementation of which is already known and has previously been described during the description of Figure 2.

The second step is a step for the carrying out of an operation OP by the identified transponder TR1 following a command C sent by the interrogator INT.

The transponder TR1 identified during the first step is placed in a listening mode E. If the interrogator unit INT has a command to transmit to this given transponder, it carries out a new modification M in the sending of its interrogation signal. This new modification M, a mute of a few microseconds for example, reinitializes the watching state of the other silent transponders for a period D2.

An anticollision channel thus being maintained open between an identified transponder TR1 and the

interrogator unit, the latter can send a command C which will be interpreted by the transponder TR1 in listening mode E, and then executed EXE. The transponder next sends a signal R in reply to the execution of the commanded operation, and then returns to a listening mode E in order to receive, if applicable, a new command C.

If no new command is sent by the interrogator unit during the time in listening mode E of the identified transponder TR1, the latter will resume the cyclic sending of its identifier Id after a random pause time P.

The method of operation of the communication system according to the present invention thus allows an interrogator unit and a given transponder to converse for as long as necessary without risk of interruption by the sending of an identifier from another transponder.

The transponders used in the present invention are transponders having a memory which can be accessible for reading and for writing or for reading only. It is thus possible to read and/or write data contained in the transponder microcircuit memory.

According to a preferential embodiment of the invention, the interrogator unit sends an interrogation signal continuously with a power of around 1 watt and with an approximate frequency of 13.5 MHz for example.

The transponders used are well known by persons skilled in the art.

The transponders used in implementing the present invention have at least receiving and sending means, a memory, and an associated memory management module.

According to a variant embodiment, the transponders can be powered by the energy of the interrogation signal sent by the interrogator unit. They then modulate part of the received signal with a code generator in order to send their identification signal.

According to another variant, the transponders can have an independent power supply and generate their own identification signal.

The transponders can also use two distinct antennas for sending and receiving or one antenna only. A single antenna can also make it possible to generate the identification signal by modulating the reflectivity.

Advantageously, the transponders also have counting means in order to determine the pause times P, the watching state durations D1 and D2 and the listening durations D of the identified transponder. These counting means can consist of a circuit dividing the interrogator clock or a circuit comprising a resistor and a capacitor.

The interrogator unit is also well known by persons skilled in the art.

The interrogator unit comprises an amplifier for the messages coming from the transponders, a circuit for extracting the data processed in a microprocessor and a clock generator.

Figure 4 illustrates the different steps of the operations performed by the interrogator unit according to the present invention.

The interrogator unit sends an interrogation signal INT continuously as has already been indicated previously.

A first step (4.1) consists of identifying a transponder following the sending of a message start frame S.

Following the reception of this message start frame S, the interrogator unit carries out a modification M of its interrogation signal INT which will be interpreted as a silence command for the transponders in pause mode whereas it is transparent for the transponder in the process of sending.

The second step (4.2) starts if a particular operation OP has to be performed by the identified transponder. If applicable, the interrogator unit carries out a new modification M of its interrogation signal INT.

A command C is next sent by the interrogator unit, and then interpreted and executed by the identified transponder TR1.

The interrogator unit then awaits the reply R from the transponder. If another command has to be executed by this transponder TR1, the interrogator unit carries out a new modification M of its interrogation signal INT and sends the new command C for a new communication cycle (4.2).

Alternatively, the interrogator unit returns to a mode awaiting a message start frame S in order to repeat the identification operation with another transponder.

5 Figure 5 illustrates schematically the different operations performed by a transponder according to the present invention.

According to a preferential embodiment, the transponder receives an interrogation signal INT which it converts by modulation into an identification signal Id sent cyclically over a duration Di with pause times P of random duration.

The first step (5.1) constitutes a step of identification by the interrogator unit.

15 Figure 6 illustrates the steps in the sending of a signal by a transponder microcircuit.

The sending of the identification signal starts with a message start frame S. This frame is advantageously composed of a byte with a value of 0, coded according to the Miller principle, that is to say a byte composed of 8 successive changes of state. This byte makes it possible to signal, to the interrogator unit, the start of the sending of a message. This byte is followed by a violation code preceding the sending of the identification, said violation code having a duration of 3 bits with no change of state.

25 A modification M in the sending of the interrogation signal INT is commanded by the interrogator unit during the receiving of this message start frame S. The modification M takes place as

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quickly as possible after receiving and recognition of a message start frame S.

This modification M is transparent for the transponder in the process of sending whereas it is interpreted as a silence command by the other transponders.

The identification message Id is then sent, followed by a checksum CRC and an end of message information item F. This end of message information item is generally constituted by a stop bit at 0 or at 1 according to the convention adopted.

A second step (5.2) starts with a listening state E allowing the transponder to receive a command from the interrogator unit which differs from the interrogation signal. This listening state E is characterised by an active state of the transponder microcircuit with no signal sending.

If no command C occurs during the listening state E, the transponder will resume the cyclic sending of its identifier Id after a random pause time P.

In the contrary case (5.4), the command C sent by the interrogator unit is executed EXE by the transponder.

According to application, this command consists of an exchange of password, a writing or reading of information to/from the transponder microcircuit memory, or the loading or modification of a program contained in the transponder microcircuit memory.

The transponder next sends a suitable reply R, and then returns to listening mode E.

A number of operations can thus be executed by a given transponder as often as a command C occurs during the listening state E of the transponder TR1.

In parallel (5.5), the transponders in pause mode TRn at the time a message start frame S is sent by another transponder will pick up a first modification M in the interrogation signal INT and will delay the sending of their own identifier by watching, for a duration D1 equal to the identifier sending duration Di multiplied by a random number N.

The modification M of the interrogation signal INT occurs a few microseconds after detection of a message start frame S from a given transponder TR1, that is to say during the pause P of the other transponders TRn.

If a new modification of the signal M occurs during the watching duration D1 of the other transponders TRn, said transponders will reinitialize the counting of their watching state and will thus delay the sending of their identifier over a duration D2 equal to the duration D1 to which the duration for executing an operation OP is added.

This duration for executing an operation OP corresponds to the duration for execution of the command C by the transponder microcircuit plus the duration for sending a reply R from the transponder to the interrogator unit.

The restarting of the delay over a duration D2 can be repeated as often as necessary in order to

maintain an anticollision channel open between the interrogator unit and a given transponder.

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CLAIMS

1. A system of communication between an interrogator unit and a plurality of transponders (TRn),

5 whereby the interrogator unit is able to detect a start of sending (S) from a transponder (TR1) and then modify (M) its interrogation signal (INT) so as to maintain the other transponders (TRn) in a watching state,

10 whereby the silent transponders (TRn) are able to interpret the modification (M) of the interrogation signal (INT) as an extended silence command, and the detected transponder (TR1) is able to continue its sending despite the modification (M) of the
15 interrogation signal (INT),

characterised in that, after identification of the detected transponder (TR1),

the interrogator unit, on the one hand, again modifies (M) its interrogation signal (INT) so as to
20 extend the watching state of the silent transponders (TRn) and, on the other hand, sends a command (C) to the identified transponder (TR1), the silent transponders (TRn) again being able to interpret the modification (M) of the interrogation signal (INT) as
25 an extended silence request,

and in that, at the end of sending its identifier (Id), the detected transponder (TR1) goes into listening mode (E) for a given duration (D) during

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which it is able to interpret and then execute the command (C) sent by the interrogator unit.

2. A communication system according to Claim 1, characterised in that each transponder (TRn) has time counting means and means of reinitializing the time counting on receiving a modification (M) of the interrogation signal (INT).

3. A communication system according to Claim 2, characterised in that the time counting means are able to determine a predetermined duration (D) of listening (E) of the detected transponder (TR1), during which said transponder (TR1) sends no signal.

4. A communication system according to Claim 1, characterised in that, after the execution (EXE) of a command (C), the identified transponder (TR1) returns to listening mode (E) for the predetermined duration (D) in order to allow a new communication phase, a new modification (M) of the interrogation signal (INT) reinitializing the watching state of the non-identified transponders (TRn), and a new command (C) being sent by the interrogator unit, interpreted and executed by the identified transponder (TR1).

5. A communication system according to Claim 1 or Claim 4, characterised in that the identified transponder (TR1) resumes the cyclic sending of its identifier (Id) after a random pause time (P) in the case where no modification (M) of the interrogation signal has occurred during the duration (D) of listening (E).

6. A communication system according to any one of the previous claims, characterised in that the modification (M) of the interrogation signal consists of a mute in the sending of the continuously sent
5 interrogation signal (INT).

7. A communication system according to any one of the previous claims, characterised in that the command (C) sent by the interrogator unit comprises information to be read and/or written and/or executed
10 by the identified transponder (TR1).

8. A method of communication between an interrogator unit and a plurality of transponders (TRn) comprising the following steps:

a - sending of a continuous interrogation signal (INT) by the interrogator unit;
15

b - sending of a message start frame (S) by a transponder (TR1);

c - detection of this frame (S) by the interrogator unit (INT);

20 d - modification (M) of the interrogation signal (INT) so as to set the silent transponders (TRn) into a watching state for a duration D1 so as to prevent them sending their identification signal;

e - reading of the identification message (Id) by
25 the interrogator unit;

the method being characterised in that it also has the following steps:

f - setting the identified transponder (TR1) into listening mode (E);

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g - modification (M) of the interrogation signal (INT) so as to reinitialize the watching state of the silent transponders (TRn) for a duration D2 so as to prevent them sending their identification signal (Idn);

5 h - sending of a command (C) by the interrogator unit (INT) to the identified transponder (TR1);

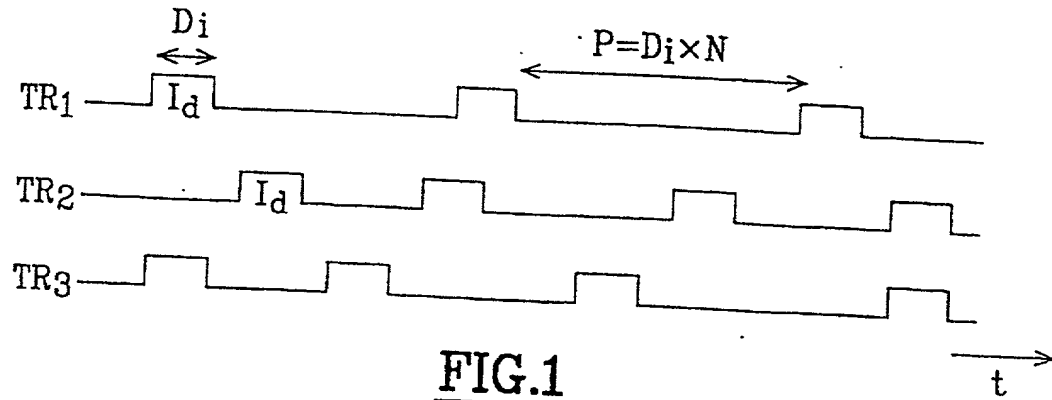
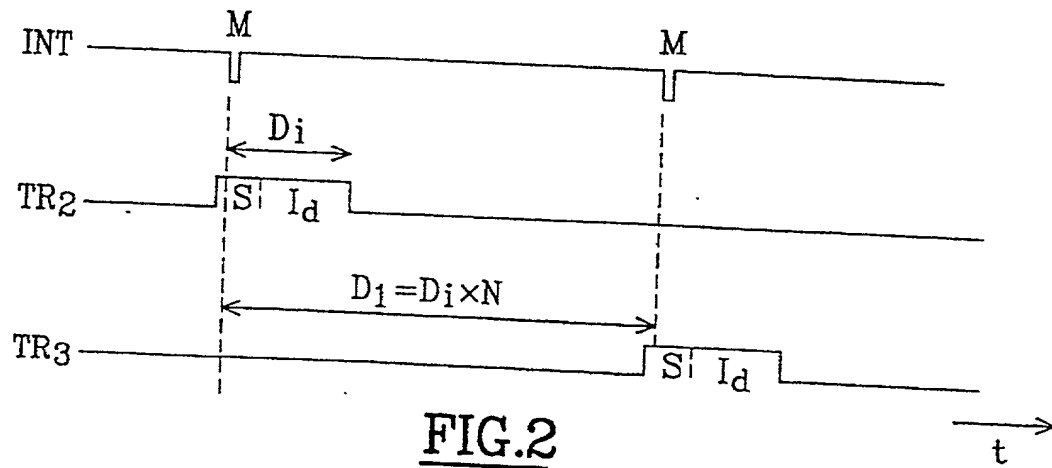
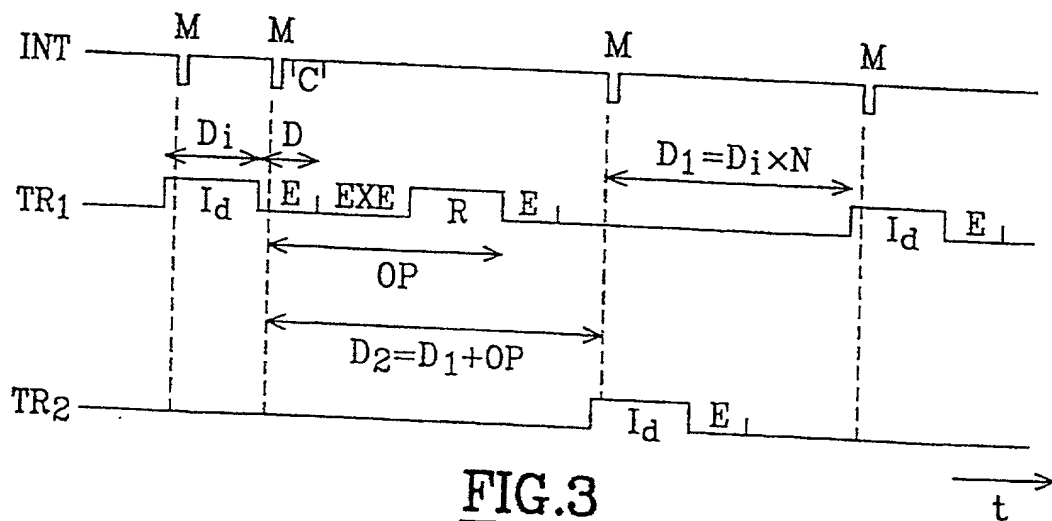
i - execution (EXE) of the command (C) by the identified transponder (TR1);

10 j - sending of the reply (REP) from the transponder (TR1).

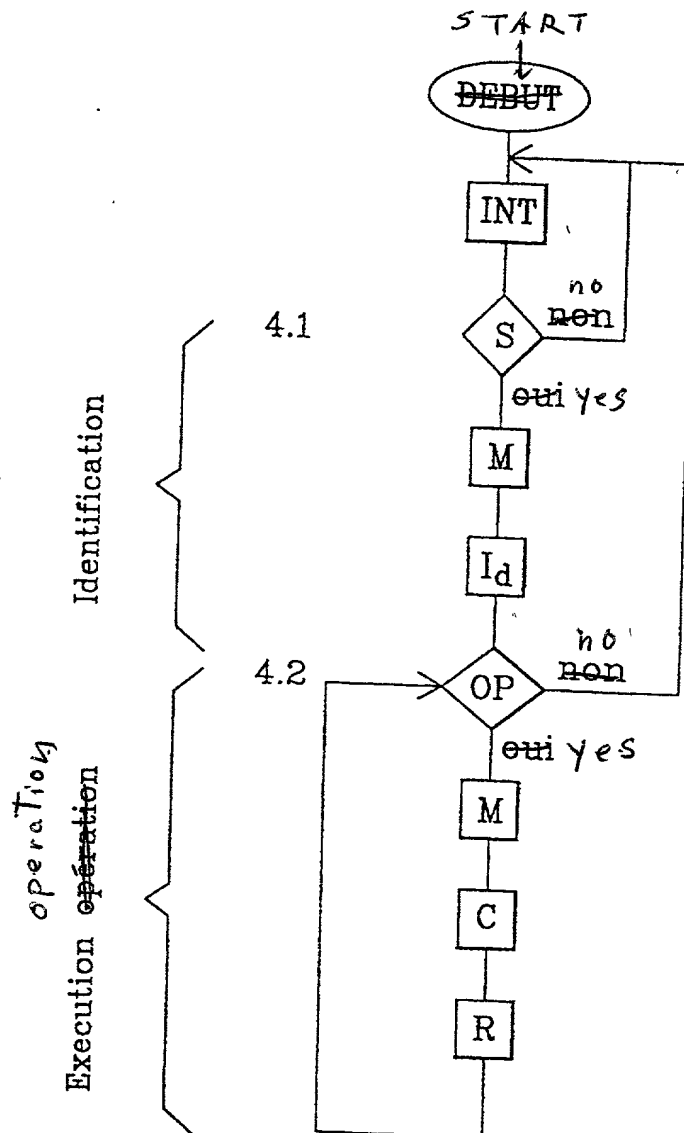
9. A communication method according to Claim 8, characterised in that it also comprises a plurality of supplementary steps, these supplementary steps consisting of returning the identified transponder (TR1) to listening mode after the step j and of carrying out the operations g to j in a loop so as to perform a plurality of operations on the identified transponder (TR1).

20 10. A communication method according to Claim 8, characterised in that the duration D2 is equal to the duration D1 added to the time for executing an operation (OP), the duration D1 corresponding to the identifier sending duration (Di) multiplied by a random number (N).

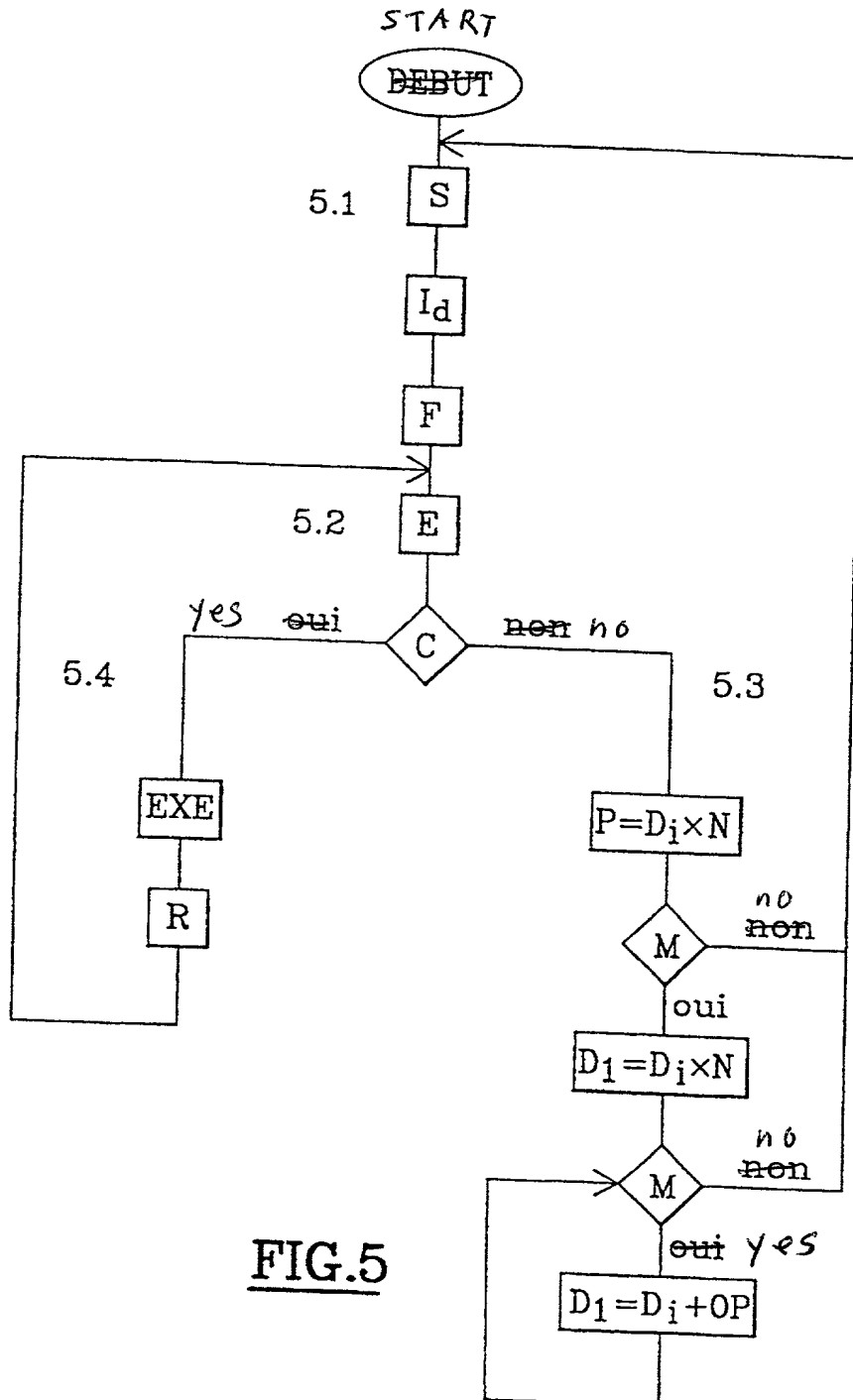
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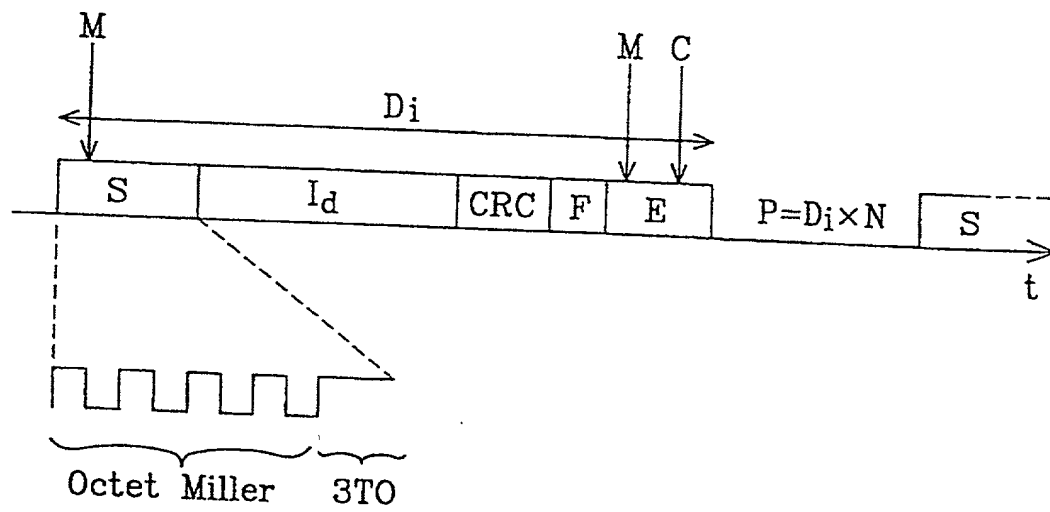
FIG. 1FIG. 2FIG. 3

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FIG.4

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FIG.5

FIG.6

**COMBINED DECLARATION AND POWER OF ATTORNEY
FOR UTILITY PATENT APPLICATION**

 Attorney's Docket No.
GEM625

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I BELIEVE I AM THE ORIGINAL, FIRST AND SOLE INVENTOR (if only one name is listed below) OR AN ORIGINAL, FIRST AND JOINT INVENTOR (if more than one name is listed below) OF THE SUBJECT MATTER WHICH IS CLAIMED AND FOR WHICH A PATENT IS SOUGHT ON THE INVENTION ENTITLED:

Maintenance of an anticollision channel in an electronic identification system

the specification of which

(check one) ☐ is attached hereto;

☐ was filed on

as

Application No. _____

And was amended on ;

(if applicable)

☒ was filed as PCT international application n°PCT/99/03221 on January 22nd 1999

I HAVE REVIEWED AND UNDERSTAND THE CONTENTS OF THE ABOVE-IDENTIFIED SPECIFICATION, INCLUDING THE CLAIMS, AS AMENDED BY ANY AMENDMENT REFERRED TO ABOVE;

I ACKNOWLEDGE THE DUTY TO DISCLOSE TO THE OFFICE ALL INFORMATION KNOWN TO ME TO BE MATERIAL TO PATENTABILITY AS DEFINED IN TITLE 37, CODE OF FEDERAL REGULATIONS, Sec. 1.56 (as amended effective March 16, 1992);

I do not know and do not believe the said invention was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to said application; that said invention was not in public use or on sale in the United States of America more than one year prior to said application; that said invention has not been patented or made the subject of an inventor's certificate issued before the date of said application in any country foreign to the United States of America on any application filed by me or my legal representatives or assigns more than twelve months prior to said application;

I hereby claim foreign priority benefits under Title 35, United States Code Sec. 119 and/or Sec. 365 of any foreign application(s) for patent or inventor's certificate as indicated below and have also identified below any foreign application for patent or inventor's certificate on this invention having a filing date before that of the application(s) on which priority is claimed:

| COUNTRY/INTERNATIONAL | APPLICATION NUMBER | DATE OF FILING (day, month, year) | PRIORITY CLAIMED |
|-----------------------|--------------------|--------------------------------------|------------------|
| FRANCE | 99/00721 | 22/01/1999 | YES |
| INTERNATIONAL | PCT/FR99/03221 | 21/12/1999 | YES |

I hereby appoint the following attorneys and agent(s) to prosecute said application and to transact all business in the Patent and Trademark Office connected therewith and to file, prosecute and to transact all business in connection with international applications directed to said invention:

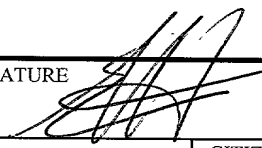
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false state-ments and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

| | | | |
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